CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

In this chapter, experiments and tests were carried out in order to examine the achievement of sewage sludge ash as a filler in concrete. The procedure of preparing the sewage sludge, the materials used for the experiment and the type of testing such as XRD test, yield analysis, compressive test, flexural are being discussed. The methodology and setup of the experiments for the concrete were conducted according to British Standard and American Standard.

3.2 PREPARATION OF MATERIAL

The concrete mix design is calculated by using a trial mix design method. The trial mix design method is used to acquire a perspective on the constituents of the concrete based on specific requirement. The proportion of the cement, water, coarse aggregate and fine aggregate was calculated based on the British DOE method. The concrete strength is specified to be 30 N/mm^2, standard deviation of 5 N/mm^2, percentage deflection of 10% (k=1. 28) due to freshness and lack of experience in casting concrete and the slump is specified to be in the allowable range of 75 ± 25 mm for the concrete mix.

3.2.1 Ordinary Portland Cement

YTL Ordinary Portland Cement (Figure 3.1) is selected as a binder for the concrete in this research. It is commonly used in the construction field in Malaysia and

easily obtained in Malaysia. For the purpose of quality control, the cement is sieved to make sure it passes through 150 μm and the cement are under the same batch of delivery. After the cement is sieved, the cement is placed in a dry storage to prevent the cement from contact with water.

Figure 3.1: Ordinary Portland Cement, ORANG KUAT brand

3.2.2 Coarse aggregrate

According to Mamlouk & Zaniewski (2006), the size where all the aggregate passes through the smallest sieve size is known as the maximum size. From the result obtained through the sieve analysis, the maximum selected size of coarse aggregate is 20 mm. Crushed stone is one of the most accessible natural resources and is a high volume, low value commodity. Crushed stone possesses the good interlocking effect and create a much better bonding than gravel. The coarse aggregate is roughly cubical in shape and flaky pieces are removed. The batch of crushed stone is washed and dried as shown in Figure 3.2 to make sure the stone is free from impurities and stored in a container for good quality control.

Figure 3.2: Crushed coarse aggregate

3.2.3 Fine aggregate

River sand is selected as the fine aggregate as river sand can be easily obtained in Malaysia. Before the sieving process, the sand is washed and dried in the oven for 24 hours to make sure the sand is dry and free of impurities. The sand is sieved to obtain the exact proportion for the zone of grading of fine aggregate (BS 882) in designing the proportion of concrete mix design. Fineness modulus of fine aggregate ranges from 2.00 to 4.00 which the smaller value indicates a finer aggregate. As shown in Figure 3.3, the sand is stored in a container to make sure that the sand is always in the dry condition.